U. S. FOREST SERVICE

RESEARCH NOTE NC-122

NORTH CENTRAL FOREST EXPERIMENT STATION, FOREST SERVICE—U.S. DEPARTMENT OF AGRICULTURE

Folwell Avenue, St. Paul, Minnesota 55101

CONTINUING WEED CONTROL BENEFITS YOUNG PLANTED BLACK WALNUT

ABSTRACT. — Cultivation, atrazine, and simazine were used for weed control 1, 2, and 3 years following planting of black walnut in Iowa and Indiana. In Iowa, 2 or more years of weed control resulted in the best seedling growth, but in Indiana 3 years proved best. Method of weed control had no significant effect on seedling growth in Iowa, but chemical control resulted in better growth than cultivation in Indiana. After 5 years in the Iowa planting, the walnut seedlings that had received weed control for 2 or 3 years continued growing faster than those that had received only 1 year of weed control, even though no weed control was done in at least the last 2 years.

OXFORD: 236.1:232.325:441 — 414.12 ATRA: 441-414.12 SIM: 176.1 *Juglans nigra* **(772) (777). KEY WORDS: simazine, atrazine, cultivation.**

The benefits of intensive weed control for good survival and growth of field crops has been recognized for years. Recent findings have indicated that management of newly planted black walnut also requires weed control the first year.[1/2/3] However, how long weed control should be continued to maintain good survival and growth of planted black walnut has not been known. In this study, we found that weeds should be controlled for more than 1 year, and that method of control may be as important as duration of control.

[1] *Erdmann, Gayne G. Chemical weed control increases survival and growth in hardwood plantings. USDA Forest Serv. Res. Note NC-34, 4 p., illus. N. Cent. Forest Exp. Sta., St. Paul, Minn. 1967.*

[2] *Erdmann, Gayne G., and Green, LeeRoy. Chemical weed control in a 2-year-old walnut planting. USDA Forest Serv. Res. Note NC-28, 4 p. N. Cent. Forest Exp. Sta., St. Paul, Minn. 1967.*

[3] *Krajicek, John E. Weed control in black walnut plantings. N. Nut Growers Ass. Ann. Rep. 60: 30-35, illus. 1969.*

METHODS

The study was established in east-central Iowa (Iowa County) on land owned by the Amana Society and in central Indiana (Morgan County) on land owned by the Pierson-Hollowell Company, Inc. The Iowa study area is on a well-drained Fayette silt loam soil located on a level to gently sloping upland site. The Indiana study area is on an imperfectly drained Whitaker silt loam soil located on a floodplain.

Weed control treatments were the same in both study areas, but the Iowa study was begun 2 years before the Indiana one. Each study area was plowed and disked, then divided into 36 plots.

Three weed control methods were used: (1) cultivation with a rotary tiller, (2) atrazine 80W powder, and (3) simazine 80W powder. Cultivation was done "as needed," but it was done more frequently in Iowa than in Indiana. The chemicals were applied in water on the soil surface in the spring at the rate of 4 pounds active ingredient (5 pounds of the powder) per acre.

All plots received complete weed control during the first year; two-thirds of these were treated for 2 years, and one-third for 3 years. Thus, there were 3 methods x 3 durations of weed control replicated 4 times, or a total of 36 plots on each area. A completely randomized experimental design was used.

Each plot contained three rows of five walnut seedlings. One-year-old seedlings were planted in an 8- by 8-foot spacing with a tree planting machine in Iowa, and in an 11- by 11-foot spacing with planting bars in Indiana.

Trees planted in Iowa were not all the same size, but they were sorted so that the average diameter an inch above the root collar (0.25 inch) and mean height (1.1 feet) were the same for all plots. In Indiana, no sorting was done (except for standard culling), but initial treatment mean heights did not vary more than 0.1 foot from the mean height of all study trees (0.8 foot).

RESULTS

At the end of 3 years, method of weed control had no significant effect on survival, height or diameter growth in Iowa.[4] In Indiana, however, trees survived better and were taller on the chemically treated plots than on the cultivated plots (table 1). Simazine-treated plots had trees of larger diameter than atrazine-treated plots, which in turn had trees of larger diameter than cultivated plots.

The number of years of weed control had little effect on survival at either location. However, the trees treated for 2 or 3 years were significantly taller and larger in diameter in both plantings than those treated for only 1 year. In addition, trees treated for 3 years in Indiana were significantly taller and larger in diameter than those treated for 2 years.

[4] *Analyses of variance and planned orthogonal comparisons were used in interpreting the data.*

Table 1. — *Summary of Iowa and Indiana results after 3 years, and Iowa after 5 years*

State	Method of control	Duration of control	After 3 years			After 5 years		
			Survival	Diameter 1/	Height	Survival	Diameter 1/	Height
		Years	Percent	Inches	Feet	Percent	Inches	Feet
Iowa	Cultivation	1	88	.7	3.7	88	1.2	5.4
		2	97	1.2	4.9	97	2.2	9.2
		3	97	1.3	4.6	97	2.5	10.4
	Atrazine	1	97	.7	3.6	97	1.2	5.4
		2	95	1.2	5.0	93	2.5	10.7
		3	90	1.3	4.9	90	2.5	10.4
	Simazine	1	98	.8	4.2	98	1.5	6.8
		2	95	1.3	5.1	95	2.5	10.7
		3	97	1.5	5.2	97	2.9	12.4
Indiana	Cultivation	1	76	.3	1.7			
		2	84	.5	2.4			
		3	81	.8	3.4			
	Atrazine	1	93	.6	2.9			
		2	94	.8	3.6			
		3	88	.9	4.3			
	Simazine	1	93	.7	3.2			
		2	96	1.0	4.6			
		3	98	1.1	5.1			

1/ One inch above the ground.

Five-year results for the Iowa planting essentially confirmed the 3-year results, but the effect of weed control method on height growth was much more evident. After 5 years, trees that received 2 or 3 years of weed control were nearly 5 feet taller, and about twice as large in diameter, as those that received only 1 year of weed control. Thus, the benefits of the longer period of weed control on growth are becoming more apparent, even though weed control has been discontinued.

DISCUSSION AND CONCLUSIONS

All plots in the study received weed control for at least the first year, so no comparison is possible with walnut planted without weed control. However, results from other studies show a great reduction in survival and growth when weed control is completely ignored.

The differences in results between Iowa and Indiana may be due in part to area effect and to weather conditions. But the poorer survival and growth on cultivated plots in Indiana are believed attributable to less intense weed control. In Iowa, no weeds were allowed to grow, whereas in Indiana plots were not cultivated until weed growth was quite dense. This emphasizes the need for *complete* weed control around the trees, regardless of the control method used.

After three growing seasons, no consistent height differences were apparent in the Iowa planting between the 2- and 3-year treatments, but in the Indiana planting there was a consistent increase in height associated with duration of treatment. In Indiana, the trees were correctively pruned. However, there was no corrective pruning in the Iowa planting, and the height growth frequently was divided among several stems on forked trees. Had these trees been correctively pruned, the effects of continued weed control probably would have been more pronounced.

Although the effect was relatively small, chemical weed control resulted in better survival and growth than mechanical cultivation in Indiana. However, the most distinct advantage of chemical weed control is that only one application per year is generally needed, whereas cultivation may be needed several times each year. Also, black walnut apparently is not harmed by soil surface applications of the chemicals used in this study. The poor results from cultivation were believed to have been the result of inadequate control of weeds and damage to the feeder roots, which are generally near the soil surface.

Results from this study show, therefore, that at least 2 years of weed control are needed for rapid growth of black walnut. Method of weed control can, in some instances, be as important as the number of years that weeds are controlled after planting. When weeds are controlled for the first 2 or 3 years, the trees can be expected to grow rapidly for at least 2 or 3 years after weed control is discontinued, and perhaps longer.

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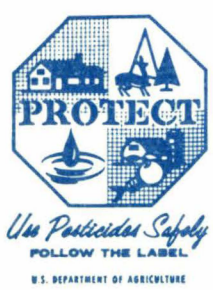

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